Training Resources for Citizen Scientists: Estimating Shorebird Flock Sizes

In 2011, Bird Studies Canada began working with shorebird specialists from Alaska to Peru on a hemisphere-wide project to investigate factors affecting the distribution and abundance of shorebirds on their wintering grounds and at migration stopovers, focusing on Western Sandpiper and Dunlin.

Counts conducted as part of the British Columbia Coastal Waterbird Survey form a significant component of this project. Estimating shorebird flock size, large and small, can be quite challenging, especially when there are predators around and the flocks are mobile. It is important to measure as accurately as possible what is happening at sites supporting both high and low numbers, because population-level changes often occur at low-use sites first, and can be harder to discern at high-use sites because of greater variation around the counts.

The concept is to compare your estimate to the actual number in a flock taken from a photograph of the same flock. You will quickly see if your estimates are above or below the actual number present, and it will help you develop a mental picture of flocks of different sizes. Here are the steps suggested by shorebird surveyors Moira Lemon, Rob Butler, Mark Drever and Pete Davidson.

1. Choose a discrete flock where you can clearly see the edges
2. Quickly photograph this flock and record the number of the photo for later.
3. Begin at one end of the flock and count off a block of 50 birds. If the flock is large you might count off 100 birds, and for very large flocks scale up to blocks of 1000 birds.
4. Now, with the mental image of what 50, 100 or 1,000 birds looks like, count the number of blocks until you reach the end of the flock.
5. Multiply the number of blocks by the number of birds per block for an estimate of the flock size.
6. Repeat steps 1 through 5 on other flocks of different sizes.
7. Back home, upload the photos on your computer and count the number of birds in the photo.
8. Compare your estimates to the actual number in each photo.

You will quickly see how close your estimates are to the actual number. Your estimates of small flocks will be more accurate than your estimates for large flocks. The next time you make a count, you will probably be more accurate. We find that many people have a consistent bias of under- or over-estimating the number present. This exercise is aimed at reducing that bias.

You should repeat the method from time to time to check whether or not you are improving. We would very much like to hear what you find. Your results will be helpful in analyzing the count data. Please send them to bcprograms@birdscanada.org.

Some tips to help you along:

1. On arrival at a site, complete a quick estimate so you have a working number in case the flock flies.
2. If the birds are moving rapidly, it is easiest to count in the direction opposite to their movement.
3. To estimate the proportion of two or more species in a mixed flock (e.g. Dunlin and Western Sandpipers), conduct a series of counts of all individuals on a transect line from the front to the back

of the flock, only counting individuals on the imaginary line to estimate the ratio of Dunlin to Western (see image below). Repeat this as many times as conditions allow (4-5 minimum).

4. For photography, use appropriate start and end markers (e.g. eagles, buoys, driftwood, etc.). The flock will need to be within ~150m using a 4-5x optical zoom for this to be worth your while, and ideally, a 10x optical zoom or higher is desirable to take images in which you can easily discern individuals.

Take a look at the image below to visualise elements of the approach described above.

Each red box represents ~100 birds; there are ~2,000 birds in the whole image. There are ~60 Dunlin and ~20 Westerns along the red transect on the left of the picture.

Next, test yourself with the images on pages 3-12, all taken by Moira Lemon (Canadian Wildlife Service) at Roberts Bank on the Fraser Estuary. Precise counts for each image are given in a table at the end of the document. No peaking until you have made estimates for each image!

Image 1: Small flock, close range, well spread out (Photographer: Moira Lemon, Canadian Wildlife Service)

Image 2: Smallish flock, close range, quite well spaced (Photographer: Moira Lemon, Canadian Wildlife Service)

Image 3: Smallish flock, close range, moderate density (Photographer: Moira Lemon, Canadian Wildlife Service)

Image 4: Smallish flock, moderate range, moderate density (Photographer: Moira Lemon, Canadian Wildlife Service)

Image 5: Medium-sized (partial) flock, moderate range, variable density (well spaced to more dense, near to far) (Photographer: Moira Lemon, Canadian Wildlife Service)

Image 6: Medium-sized (partial) flock, close range, quite dense (Photographer: Moira Lemon, Canadian Wildlife Service)

Image 7: Medium-sized flock, quite distant, quite dense (Photographer: Moira Lemon, Canadian Wildlife Service)

Image 8: Larger (partial) flock, mid-distance, quite dense (Photographer: Moira Lemon, Canadian Wildlife Service)

Image 9: Larger (partial) flock, mid-distance, dense (Photographer: Moira Lemon, Canadian Wildlife Service)

Image 10: Smallish, roosting flock, near to mid-distance, very dense (Photographer: Moira Lemon, Canadian Wildlife Service)

The Actual Counts

Determined by Moira Lemon using a computer and ArcGIS software

Image #	Year	Flock density	Flock distance	Total # individuals
1	2006	spread out	near	66
2	2005	spread out	near	261
3	2006	medium dense	near	291
4	2010	spread-out to thick	near	415
5	2011	medium thick	near to mid	889
6	2010	dense	near	1107
7	2011	dense	mid distance	637
8	2009	medium thick	near to mid	2187
9	2011	thick	near to mid	1131
10	2005	dense	mid-distance	565